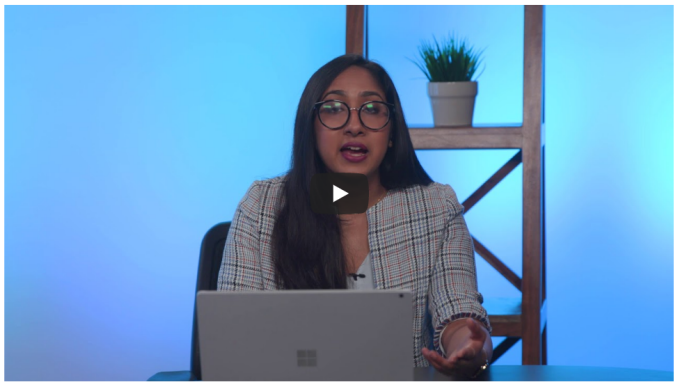
Models vs. Algorithms



In machine learning, the key distinction of a model and an algorithm is:

> ***Models** are the **specific representations** learned from data*
>
> ***Algorithms** are the processes of **learning***

We can think of the algorithm as a function—we give the algorithm data and it produces a model:

$$Model = Algorithm(Data)$$

On the next page, we'll look at this distinction in the context of a concrete example: Linear regression.

More About Machine Learning Algorithms

We can think of an algorithm as a mathematical tool that can usually be represented by an equation as well as implemented in code. For example, `y = Wx + b` is an algorithm that can be used to calculate y from x if the values for `W` and `b` are known. But how do we get `W` and `b`?

This is the *learning* part of machine learning; That is, *we can learn these values from training data*. For example, suppose the following data are collected:

x	y
1	1
2	2
3	3

We can plug the data into the algorithm and calculate `W = 1` and `b = 0`. We would say that that the *algorithm was run on the data and learned the values ofr* `W` *and* `b`. The output of the learning process is `W = 1` and `b = 0`.

Machine Learning Models

Machine learning models are *outputs* or *specific representations* of algorithms that run on data. A model represents *what is learned* by a machine learning algorithm on the data.

In the previous example, `y = 1*x + 0` is the model we obtained from running the algorithm `y = Wx + b` on the training data. We can also say that `y = 1*x + 0` is the model that can be used to predict `y` from `x`.

A machine learning model can also be written in *a set of weights or coefficients* instead of a full equation. Looking at the previous example, since we know the algorithm, it is redundant to keep the full equation `y = 1*x + 0`. All we need are the weights (or coefficients) `W = 1` and `b = 0`. Thus, we can also think of a model as a set of weights (or coefficients) that have been learned.

QUIZ QUESTION

Which of these are examples of **algorithms** and which are examples of **models**?

Submit to check your answer choices!

EXAMPLE	ALGORITHM OR MODEL?
Least Squares Linear Regression	algorithm
Convolutional neural network	algorithm
Set of coefficients	model
An equation learned from data	model

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